Abhrajyoti Kundu
Computer Science & IT (CS)

THEORY OF COMPUTATION-2: (GATE 2022) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(11) | INCORRECT(5) | SKIPPED(1)

Q. 11 FAQ | Solution Video | Have any Doubt ?

Let G = (V, T, P, S) be any context free grammar without any ∈ productions or unit productions. Let m be the maximum number of symbols on the right of any production in P. The maximum number of production rules for any equivalent grammar in Chomsky Normal Form is given by (| · | denotes the cardinality of the set).

A $m|P| + |T|$

B $(m-1)|P| + |T|$ — Your answer is **Correct**

Solution :
(b)
This is the standard theorem in Peter Linz and answer is $(m-1)|P| + |T|$.

C $m|P| + |T| - 1$

D $(m-1)|P| + |T| - 1$

QUESTION ANALYTICS +

Q. 12 Solution Video | Have any Doubt ?

Which of the following grammar can generate the language $L = \{a^i b^j c^k \mid i > k, 0 \le j < 3, k \ge 0\}$?

A $X \to aXc \mid X \to aX \mid c$

B $S \to aS \mid aSc \mid a \mid ab \mid abb \mid abbb$

C $S \to aS \mid aSc \mid a \mid ab \mid abb$ — Your answer is **Correct**

Solution :
(c)

$$L = \{a^i b^j c^k \mid i > k, 0 \le j < 3, k \ge 0\}$$

The context-free grammar for the given language can be
$S \to aS$
$S \to aSc$
$S \to a$
$S \to ab$
$S \to abb$

D None of these

QUESTION ANALYTICS +

Q. 13 FAQ | Solution Video | Have any Doubt ?

Consider $L = L_1 \cap L_2$ where
$L_1 = \{0^m 1^m 2^n 1^n \mid m, n \ge 0\}$
$L_2 = \{0^m 1^n 2^k \mid m, n, k \ge 0\}$

Then, the language L is

A Recursively enumerable but not context free — Your answer is **IN-CORRECT**

B Regular

C Context free but not regular — Correct Option

Solution :

(c)

$$L = L_1 \cap L_2$$

$L = \{0^m 1^m \mid m \geq 0\}$ which is CFL but not regular because there is a infinite comparison.

D Not recursive

QUESTION ANALYTICS +

Q. 14 ? FAQ ▶ Solution Video Have any Doubt ?

Consider the statements:

I. The problem "Is $L_1 \wedge L_2 = \phi$" is undecidable for context sensitive languages L_1 and L_2.

II. The problem "Is $w \in L$?" is decidable for context sensitive language L. (where w is a string).

The number of correct statements is/are _____.

2 Your answer is **Correct2**

Solution :
2
Both statement are true.
• Checking emptiness or intersection between 2 language in CSL is Undecidable.
• Checking membership problem for CSL is decidable.

QUESTION ANALYTICS +

Q. 15 ▶ Solution Video Have any Doubt ?

Given language $L = \{x^m y^m \mid m > 0\}$. Now consider the given statements:

I. $E \rightarrow xEy \mid xy$

II. $xy \mid x^+ xyy^+$

III. x^+y^+

The number of the correct statements which generates L is/are _____.

1 Correct Option

Solution :
1
Given language L is CFL, hence it can not be generated either through regular grammar and or regular expression. Statement I is CFG and generates L.

Your Answer is 2

QUESTION ANALYTICS +

Q. 16 ? FAQ ▶ Solution Video Have any Doubt ?

Which of the following are true?

A The complement of an RE language can be not-RE. Your option is **Correct**

B The complement of an REC language can be RE. Correct Option

C The complement of a non-DCFL can be a DCFL.

D The complement of a language accepted by a NFA can be acceptable by a DFA. Your option is **Correct**

YOUR ANSWER - a,d | CORRECT ANSWER - a,b,d | STATUS - ✗

Solution :
(a, b, d)

QUESTION ANALYTICS +

Q. 17 ? FAQ ▶ Solution Video Have any Doubt ?

Consider the following languages:
$L_1 = \{a^i b^j c^k\} \cup \{a^i b^i c^j\}\ i, j \geq 0.$
$L_2 = \{ww^R \mid w \in \{a, b\}^*\}$ where R represents reversible operation.
$L_3 = \{a^m b^n c^k \mid m, n, k \geq 0\}$
Which one of the following is(are) inherently ambiguous language(s)?

A L_1 — Your option is **Correct**

B L_2

C L_3

D None of these

YOUR ANSWER - a | CORRECT ANSWER - a | STATUS - ✓

Solution :

(a)

- If there is no context free grammer for L which is unambiguous. Hence L is inherently ambiguous or in other words "A language for which every grammar is ambiguous is called inherently ambiguous language".
  Note: If a language is regular or DCFL it will surely can be written in unambiguous grammar.

- So, surely L_3 can't be inherently ambiguous language as it is regular language.
- L_2 is not inherently ambiguous language as we can write grammar for L_2 which is unambiguous.

$$S \rightarrow aSa \mid bSb \mid \epsilon$$

- L_1 is CFL and it is inherently ambiguous language because L_1 is language with union of two DCFL. So the grammar will always have OR operation which will make them ambiguous.
  Let's see how we can write grammar.

$S \rightarrow X \mid Y$
$X \rightarrow aXc \mid P$
$P \rightarrow bP \mid \epsilon$
$Y \rightarrow aYb \mid Q$
$Q \rightarrow cQ \mid \epsilon$

If we generate string 'abc' two parse tree possible either through X or Y.
Hence it is ambiguous and leads to inherently ambiguous language.

QUESTION ANALYTICS +